

1                   **METHOD AND APPARATUS OF VERIFYING AND**  
2                   **MANAGING MULTIPLE SYSTEMS IN A WIRELESS**  
3                   **COMMUNICATIONS DEVICE**

4    BACKGROUND OF THE INVENTION

5    1. Field of the Invention

6           The present invention is related to a method and apparatus of verifying  
7    and managing multiple systems in a wireless communications device, and more  
8    particularly to a method and apparatus of verifying and managing multiple  
9    systems for selection of an appropriate wireless communications system among  
10   several other alternative systems according to a user-defined priority ordering to  
11   log in a target network system.

12   2. Description of Related Art

13          The fast developments in the computer, wireless communications and  
14   internet-related industries have created a strong demand for 3C products. By  
15   integrating the functions of computers, network connectivity and  
16   communications under one system, 3C products fit well into the life styles of  
17   contemporary people, besides the practical values from using these products.

18          Recent changes in the personal computer market have confirmed that  
19   continuing trend of cross-domain integration of computers, communications and  
20   internet technologies. As the prices of notebook computers continue to decrease,  
21   many desktop computer users are planning to replace their desktop computers  
22   with notebook computers or flat panel computers. Another attention-grabbing  
23   item is the personal digital assistant (PDA), because it has the data processing  
24   capability and good portability.

1           Users now not only demand the basic data processing capability in  
2 digital devices but also the network connectivity and wireless communications  
3 interface. An ordinary network user is able to use a mobile phone, a personal  
4 digital assistant (PDA), a notebook computer or flat panel computer equipped  
5 with a Bluetooth module to access the Internet domain through open air. A  
6 digital computer configured with a Bluetooth module and a repeater can be  
7 operated as a base station, through which a bi-directional communication link  
8 can be established with one or more mobile stations, such as mobile phones, for  
9 voice and data communications.

10           Currently used wireless communications systems are not yet  
11 standardized, and each version is specialized for a somewhat different  
12 application. For example, two different systems are respectively developed for  
13 point-to-point connection and wireless local area network (WLAN) connection.  
14 With such diversity in wireless communications systems, most personal and  
15 mobile communications manufacturers adopt one wireless communications  
16 system which can bring out the functionality of their products for promotions.  
17 However, network users often encounter a compatibility problem across  
18 different systems, as the systems installed in the communications devices at  
19 respective ends might not be the same. Therefore, future wireless  
20 communications devices shall be designed with at least two communications  
21 systems.

22           The majority of network activities are value-added web services that are  
23 rendered to the network users for a charge, which might be different for each  
24 network user depending on the connection modes used. For example, network

1 users using a GSM system and a net phone (VoIP) get different charge rates. The  
2 difference in rates will be directly reflected in the operation costs of network  
3 users, so they naturally look for ways to economize on the communications costs  
4 by choosing the most efficient wireless communications system and  
5 communications channel when several alternatives are equally applicable.

## 6 SUMMARY OF THE INVENTION

7 The main objective of the present invention is to provide a method of  
8 verifying and managing a diverse communications interface of a wireless  
9 communications device, whereby an appropriate wireless communications  
10 system can be selected from several other alternative systems according to a  
11 user-defined priority ordering to log in a target network system, thus enabling  
12 the network user to attain high efficiency in the network usage and reduce  
13 operation costs.

14 To this end, the method of the present invention include the acts of:

15 preparing multiple wireless communications systems in a wireless  
16 communications device;

17 enabling the wireless communications device to use a first network  
18 interface to log in a first network system to form a regular line connection after a  
19 verification process;

20 enabling the wireless communications device to use a second network  
21 interface to log in a second network system to establish a line connection after a  
22 cross verification process;

23 determining whether the wireless communications device is using the  
24 second network system to provide services similar to the first network system; if

1 the wireless communications device is using the second network system in said  
2 manner, the system temporarily halts the existing link with the first network  
3 system; and

4 determining whether the above services from the second network system  
5 through the second network interface have terminated; if the above services have  
6 terminated, the system resumes the original link with the first network system  
7 through the first network interface after the verification process.

8 Using the above method, the wireless communication device, i.e. the  
9 digital computer or the repeater, is able to maintain line connection with at least  
10 one network system at any given time, in accordance with the user-defined  
11 priority ordering. Further, the digital computer or the repeater is capable of  
12 switching to another wireless communications system when certain external  
13 conditions are changed.

14 The above first network system represents a GPRS/GSM mobile phone  
15 system.

16 The above second network system is the wireless local area network  
17 (WLAN) compliant with the 802.11b protocol.

18 According to the first aspect of the present invention, using the second  
19 network system to provide services similar to the first network system is where a  
20 network user can make use of the net phone (VoIP) function on a computer  
21 system to make a call to a remote phone through the wireless local area network  
22 (WLAN) connection, or the network user can log in the internet to transmit and  
23 receive electronic mails through the WLAN.

24 The second objective of the present invention is to provide a cross

1 verification apparatus to select an appropriate wireless communications system  
2 from several other alternative systems in accordance with a user-defined priority  
3 ordering, whereby the digital computer using the matching system can be  
4 automatically logged in the target network system to form a regular line  
5 connection.

6 To this end, the structure of the present invention comprises:

7 a microprocessor for data processing, interfacing multiple  
8 communications systems and serving as control hub;

9 a data switch formed by at least two multiplexers and respectively  
10 connected to two SIM sockets, wherein one of the two multiplexers controls the  
11 path from the first network interface to the two SIM sockets;

12 a card reader connected through the data switch to the two SIM sockets;

13 a data link module connected between the microprocessor and the card  
14 reader for controlling bi-directional communications; and

15 a second network interface connected to the microprocessor, and also to  
16 the two SIM sockets through the microprocessor and the data switch.

17 According to the second aspect of the present invention, the above  
18 apparatus uses the data switch to select one of the two SIM cards loaded in the  
19 respective SIM sockets, so that the system can be linked to the corresponding  
20 network system through the first network interface after the verification process.

21 When the system detects that certain external conditions are changed, the first  
22 wireless communications system will be replaced by the second wireless  
23 communications system, or vice versa. Under the above conditions, the  
24 microprocessor orders the data switch to change the data path of the card reader

1 from the first SIM card to the second SIM card, so that data on the second SIM  
2 card can be read and passed to the microprocessor, and then the microprocessor  
3 initiates a line connection through the second network interface to the second  
4 network system.

5  
6 Other objectives, advantages and novel features of the invention will  
7 become more apparent from the following detailed description when taken in  
8 conjunction with the accompanying drawings.

#### 9 BRIEF DESCRIPTION OF THE DRAWINGS

10 Fig. 1 is block diagram of the system architecture of the present  
11 invention;

12 Figs. 2A-H show a circuit diagram of the microprocessor;

13 Figs. 3A-3F show a circuit diagram of the data switch/card reader/data  
14 link module;

15 Figs. 4A-4E show a circuit diagram of the GSM interface; and

16 Figs. 5A-5D shown a circuit diagram of a transceiver for WLAN.

#### 17 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

18 The present invention is illustrated through a preferred embodiment, in  
19 which an apparatus of verifying and managing multiple systems in a wireless  
20 communications device is provided as shown by Fig. 1.

21 A microprocessor (10), for data processing, interfacing multiple  
22 communications systems and serving as a control hub.

23 A data switch (20) formed by at least two multiplexers (21) (22), which  
24 are respectively connected to two SIM sockets (23) (24) for switching the data

1 paths to the SIM sockets (23) (24) under the control of the microprocessor (10).  
2 Each of the two SIM sockets (23) (24) is to receive a SIM card. One of the two  
3 multiplexers (21) controls the path from the first network interface (11) to the  
4 two SIM sockets (23) (24), whereby the first network interface (11) is able to  
5 obtain the read data from the two SIM cards.

6 A card reader (30) connected to the SIM cards loaded in the two SIM  
7 sockets (23) (24) through the action of the data switch (20).

8 A data link module (40), containing a UART transmitter control circuit,  
9 connected between the microprocessor (10) and the card reader (30) for  
10 controlling bi-directional communications.

11 A second network interface (12) connected to the microprocessor (10),  
12 through which the second network interface (12) is connected to the data link  
13 module (40), card reader (30), and data switch (20), and further connected to the  
14 two SIM cards.

15 Both SIM cards contain the telephone numbers for the GPRS/GSM  
16 system; or else one of the two cards carries a GPRS/GSM telephone number, and  
17 the other card contains the account number for a wireless local area network  
18 (WLAN).

19 The actual cross-verification is to be explained using the WLAN as an  
20 example:

21 The above first network interface (11) is for making connection to the  
22 GPRS/GSM mobile phone system. The second network interface (12) is a  
23 wireless transceiver for the WLAN, through which the second network interface  
24 (12) can establish a link with the WLAN that supports 802.11b wireless

1 communications protocol.

2           When the microprocessor (10) orders the multiplexer (21) of the data  
3 switch (20) to enable the data path from one of the two SIM cards to the first  
4 network interface (11), the first network interface (11) uses the data accessed  
5 from the SIM card to log in the GPRS/GSM mobile phone system to form a  
6 regular line connection after the cross verification process.

7           If a personal computing device or a repeater connected to a personal  
8 computing device is within the broadcasting range of the WLAN, the  
9 microprocessor (10) orders the data switch (20) to connect the card reader (30)  
10 and the second SIM card, so that the card reader (30) reads off the data from the  
11 second SIM card, and passes them through the data link module (40) to the  
12 microprocessor (10). The microprocessor (10) then activates the second network  
13 interface (12) which uses the information to initiate a line connection to the  
14 WLAN after the cross verification process.

15           Through the above procedures, a personal computing device (referring  
16 to a personal computer, a notebook computer, a flat panel computer or a personal  
17 digital assistant (PDA)) or a repeater having the above cross verification  
18 apparatus is able to make connection with a mobile phone network and a  
19 wireless local area network (WLAN). The mobile phone network provides  
20 telephone and data transmission services, and the WLAN provides the local area  
21 network connection and web services. It shall be pointed out that the telephone  
22 rate for mobile phones is substantially higher than that through the net phone  
23 (VoIP) over the Internet.

24           When a network user uses the net phone (VoIP) to make a telephone call



1 to the remote end, the microprocessor (10) will temporarily terminate the  
2 existing link with the mobile phone network. After the call through the net phone  
3 (VoIP) has terminated, the microprocessor (10) orders the data switch (20) to  
4 switch back to the original line connection through the first network interface (11)  
5 to the GPRS/GSM mobile phone system.

6 By this means, the GSM(Voice)/ GPRS(data) service originally  
7 provided by the first network system can be transferred to the second network  
8 system (WiFi Network) through the application of the net phone (VoIP), such  
9 that a higher efficiency of network usage and lower telephone rates can be  
10 realized by the network user.

11 The above mentioned two wireless communications systems can be  
12 assigned different priority values according to personal preference of the  
13 network user, so that when both systems are equally applicable for linking to a  
14 particular target network system, the wireless communications system with the  
15 highest priority will be selected automatically. The network interface linking the  
16 wireless local area network (WLAN) is often assigned the highest priority for the  
17 purposes explained above.

18 The above two SIM cards may both contain GPRS/GSM telephone  
19 numbers. When these two cards both contain the mobile phone numbers, it is still  
20 possible to assign a different priority to differentiate the line connections for  
21 attaining top efficiency in the network usage.

22 Using the above method and apparatus, the system is able to maintain  
23 line connection with at least one network system at any given time, and through  
24 the priority selection the system is capable of selecting a wireless

1 communications system with the highest priority to connect to the target network  
2 system.

3 The actual control circuitry for implementing the above cross  
4 verification apparatus is illustrated in the circuit diagrams of Figs. 2A-5D.

5 The cross verification apparatus of the present invention can be installed  
6 in the personal computing device, or set up as a separate peripheral device with  
7 line connection to the personal computing device, or the apparatus can be  
8 embedded in the repeater, where the repeater is linked to the personal computing  
9 device by wireless means, so that the personal computing device is able to select  
10 an appropriate wireless communications system from several other alternative  
11 systems through the cross verification and priority selection processes.

12 From the foregoing, the present invention provides a method of cross  
13 verification and managing multiple communications systems in a wireless  
14 communications device to log in the target network system. In the automatic  
15 entry process, a different priority value can be assigned to each alternative  
16 communication system, such that an appropriate wireless communications  
17 system will be selected automatically, according to a user-defined priority  
18 ordering, in the process of establishing a line connection with a target network  
19 system, thus top efficiency of network usage can be attained.

20 It is to be understood, however, that even though numerous  
21 characteristics and advantages of the present invention have been set forth in the  
22 foregoing description, together with details of the structure and function of the  
23 invention, the disclosure is illustrative only, and changes may be made in detail,  
24 especially in matters of shape, size, and arrangement of parts within the

- 1 principles of the invention to the full extent indicated by the broad general
- 2 meaning of the terms in which the appended claims are expressed.